tdata=0.004

load('data\_t.mat')

data\_test1=data\_t.eeg1;

data\_test2=data\_t.emg1;

data\_test2=data\_test2\*(3.3/4096);

data\_test1=data\_test1\*(3.3/4096);

data\_test3=data\_t.eeg2;

data\_test3=data\_test3\*(3.3/4096);

fdata=length(data\_test1)/120;

tdata=1/fdata;

T\_data=[0:1:(18420-1)]\*tdata;

figure;plot(T\_data,data\_test1)

title('EEG\_r\_a\_w\_(\_D\_C\_)')

xlabel('Time(s)')

ylabel('Volts(V)')

figure;plot(T\_data,data\_test2)

title('EMG\_r\_a\_w\_(\_D\_C\_)')

xlabel('Time(s)')

ylabel('Volts(V)')

%removing dc component

data\_test1fft=fft(data\_test1);

data\_test1fft(1)=0;

data\_test1=ifft(data\_test1fft);

plot(T\_data,data\_test1)

title('EEG\_r\_a\_w\_(\_D\_C\_r\_e\_m\_o\_v\_e\_d\_)')

xlabel('Time(s)')

ylabel('Volts(V)')

data\_test1fft=fft(data\_test2);

data\_test1fft(1)=0;

data\_test2=ifft(data\_test1fft);

figure;plot(T\_data,data\_test2)

title('EEG\_r\_a\_w\_(\_D\_C\_r\_e\_m\_o\_v\_e\_d\_)')

xlabel('Time(s)')

ylabel('Volts(V)')

data\_test1fft=fft(data\_test3);

data\_test1fft(1)=0;

data\_test3=ifft(data\_test1fft);

figure;plot(T\_data,data\_test3)

title('noise\_r\_a\_w\_(\_D\_C\_r\_e\_m\_o\_v\_e\_d\_)')

xlabel('Time(s)')

ylabel('Volts(V)')

%smoothening and detrending the data

% Smooth input data

smoothedData1 = smoothdata(data\_test1,"gaussian","SmoothingFactor",0.2);

% Display results

clf

plot(data\_test1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData1,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Smoothed data")

hold off

legend

% Remove trend from data

smoothedData2 = detrend(smoothedData1);

% Display results

clf

plot(smoothedData1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData2,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Detrended data")

plot(smoothedData1-smoothedData2,"Color",[217 83 25]/255,"LineWidth",1,...

"DisplayName","Trend")

hold off

legend

% Smooth input data

smoothedData2 = smoothdata(data\_test2,"movmean","SmoothingFactor",0.35);

% Display results

clf

plot(data\_test2,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData2,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Smoothed data")

hold off

legend

% Remove trend from data

smoothedData2 = detrend(smoothedData2);

% Display results

clf

plot(smoothedData2,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData2,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Detrended data")

plot(smoothedData2-smoothedData2,"Color",[217 83 25]/255,"LineWidth",1,...

"DisplayName","Trend")

hold off

legend

%t1,data\_test2);

% pspectrum(corr\_data,fdata,"power",FrequencyLimits=[0,20]);

% % corr\_data\_pwr=xcorr2(pdeeg1,pdeeg2);

% auto\_data1=autocorr(data\_test1);

% auto\_data2=autocorr(data\_test2);

% plot(corr\_data\_pwr)

% plot(auto\_data1);

% pspectrum(auto\_data1,fdata,"power",'MinThreshold',0,"FrequencyLimits",[0,20])

% pspectrum(corr\_data,fdata,"power",FrequencyLimits=[0,20]);

figure;

subplot(2,3,1)

pspectrum(data\_test1,fdata,'spectrogram','TimeResolution',1,'overlapPercent',90,'MinThreshold',-30,FrequencyLimits=[0,10]);title('eegdata');

subplot(2,3,2)

pspectrum(sqrt((data\_test1).^2-(data\_test3).^2),fdata,'spectrogram','MinThreshold',-30,'TimeResolution',1,'overlapPercent',90,FrequencyLimits=[0,10]); title('eegdata\_r\_m\_s');

subplot(2,3,3)

plot(T\_data,data\_test1);title('eegdata\_r\_a\_w');

subplot(2,3,4)

pspectrum(data\_test2,fdata,'spectrogram','TimeResolution',1,'overlapPercent',90,'MinThreshold',-30,FrequencyLimits=[0,10]);title('emgdata');

subplot(2,3,5)

pspectrum(sqrt((data\_test2).^2-(data\_test3).^2),fdata,'spectrogram', 'TimeResolution',1,'overlapPercent',90,'MinThreshold',-30,FrequencyLimits=[0,10]);title('emgdata\_r\_m\_s');

subplot(2,3,6)

plot(T\_data,data\_test2);title('emgdata\_r\_a\_w');

subplot(2,3,3)

xlabel('Time(s)')

ylabel('Volts(V)')

subplot(2,3,6)

xlabel('Time(s)')

ylabel('Volts(V)')

Raw data plots

figure;

title('50 overlap')

subplot(2,3,1)

pspectrum(smoothedData1,fdata,'spectrogram','TimeResolution',1,'overlapPercent',90,'MinThreshold',-30,FrequencyLimits=[0,10]);title('eegdata');

subplot(2,3,2)

pspectrum(sqrt((smoothedData1).^2-(data\_test3).^2),fdata,'spectrogram','MinThreshold',-30,'TimeResolution',1,'overlapPercent',90,FrequencyLimits=[0,10]); title('eegdata\_r\_m\_s');

subplot(2,3,3)

plot(T\_data,smoothedData1);title('eegdata\_(smooth)');

subplot(2,3,4)

pspectrum(smoothedData2,fdata,'spectrogram','TimeResolution',1,'overlapPercent',90,'MinThreshold',-30,FrequencyLimits=[0,10]);title('emgdata');

subplot(2,3,5)

pspectrum(sqrt((smoothedData2).^2-(data\_test3).^2),fdata,'spectrogram', 'TimeResolution',1,'overlapPercent',90,'MinThreshold',-30,FrequencyLimits=[0,10]);title('emgdata\_r\_m\_s');

subplot(2,3,6)

plot(T\_data,smoothedData2);title('emgdata\_(smooth)');

subplot(2,3,3)

xlabel('Time(s)')

ylabel('Volts(V)')

subplot(2,3,6)

xlabel('Time(s)')

ylabel('Volts(V)')

Smoothened and detrended data

[pdeeg2,feeg2]=pspectrum(sqrt((data\_test2).^2-(data\_test3).^2),fdata,'power',FrequencyLimits=[0,10]);

[pdeeg1,feeg1]=pspectrum(sqrt((data\_test1).^2-(data\_test3).^2),fdata,'power',FrequencyLimits=[0,10]);

[eig\_xcorr,time\_eig\_xcorr]=crosscorr(pdeeg1,pdeeg2);

figure;

plot(time\_eig\_xcorr,eig\_xcorr);title('power spectrum matrix eigvalue xcorr');

figure;

title('50 overlap')

subplot(2,3,1)

pspectrum(data\_test1,fdata,'power',FrequencyLimits=[0,5]);title('eegdata');

subplot(2,3,2)

pspectrum(data\_test2,fdata,'power',FrequencyLimits=[0,5]);title('emgdata');

subplot(2,3,3)

pspectrum(data\_test3,fdata,'power',FrequencyLimits=[0,5]);title('unconected pin noise');

subplot(2,3,4)

pspectrum(sqrt((data\_test1).^2-(data\_test3).^2),fdata,'power',FrequencyLimits=[0,5]); title('eegdata\_r\_m\_s');

subplot(2,3,5)

pspectrum(sqrt((data\_test2).^2-(data\_test3).^2),fdata,'power',FrequencyLimits=[0,5]);title('emgdata\_r\_m\_s');

subplot(2,3,6)

plot(time\_eig\_xcorr,eig\_xcorr);title('power spectrum matrix eigvalue xcorr');

figure;

title('50 overlap')

subplot(2,3,1)

pspectrum(smoothedData1,fdata,'power',FrequencyLimits=[0,5]);title('eegdata');

subplot(2,3,2)

pspectrum(smoothedData2,fdata,'power',FrequencyLimits=[0,5]);title('emgdata');

subplot(2,3,3)

pspectrum(data\_test3,fdata,'power',FrequencyLimits=[0,5]);title('unconected pin noise');

subplot(2,3,4)

pspectrum(sqrt((smoothedData1).^2-(data\_test3).^2),fdata,'power',FrequencyLimits=[0,5]); title('eegdata\_r\_m\_s');

subplot(2,3,5)

pspectrum(sqrt((smoothedData2).^2-(data\_test3).^2),fdata,'power',FrequencyLimits=[0,5]);title('emgdata\_r\_m\_s');

subplot(2,3,6)

plot(time\_eig\_xcorr,eig\_xcorr);title('power spectrum matrix eigvalue xcorr');

%figure;pspectrum(data\_test2,fdata,'persistence',FrequencyLimits=[0,5]);title('emgdata');

% figure;

% title('50 overlap')

% subplot(2,3,1)

% pspectrum(data\_test1,fdata,'spectrogram','MinThreshold',3,'TimeResolution',0.5,'overlapPercent',90,FrequencyLimits=[0,15]);title('eegdata');

% subplot(2,3,2)

%

% pspectrum(data\_test2,fdata,'spectrogram','MinThreshold',3,'TimeResolution',0.5,'overlapPercent',90,FrequencyLimits=[0,15]);title('emgdata');

% subplot(2,3,3)

% pspectrum(data\_test3,fdata,'spectrogram','MinThreshold',-10,'TimeResolution',0.5,'overlapPercent',90,FrequencyLimits=[0,15]);title('unconected pin noise');

% subplot(2,3,4)

% pspectrum(sqrt((data\_test1).^2-(data\_test3).^2),fdata,'spectrogram','MinThreshold',3,'TimeResolution',0.5,'overlapPercent',90,FrequencyLimits=[0,15]); title('eegdata\_r\_m\_s');

% subplot(2,3,5)

% pspectrum(sqrt((data\_test2).^2-(data\_test3).^2),fdata,'spectrogram','MinThreshold',3,'TimeResolution',0.5,'overlapPercent',90,FrequencyLimits=[0,15]);title('emgdata\_r\_m\_s');

% subplot(2,3,6)

% dft\_data1=fft(data\_test1);

% f\_dft=(0:length(dft\_data1)-1)\*100/length(dft\_data1);

% plot(f\_dft,dft\_data1)

out\_sept\_12=[data\_test1,data\_test2];

out\_sept\_12\_smooth=[smoothedData1,smoothedData2];